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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
09/638,194	08/11/00	KOIWA S	S004-4061

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ADAMS & WILKS
ATTORNEYS AND COUNSELORS AT LAW
31ST FLOOR
50 BROADWAY
NEW YORK NY 10004

EXAMINER	
MONDT, J	
ART UNIT	PAPER NUMBER
2826	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

Office Action Summary	Application No.	Applicant(s)	
	09/638,194	KOIWA, SUMIO	
	Examiner	Art Unit	
	Johannes P Mondt	2826	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136 (a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37.CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____ .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-3 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-3 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claims _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are objected to by the Examiner.

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

Attachment(s)

15)☒ Notice of References Cited (PTO-892)
16)☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
17)☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
18)☐ Interview Summary (PTO-413) Paper No(s). _____ .
19)☐ Notice of Informal Patent Application (PTO-152)
20)☐ Other:

Specification

1. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed. "Photodiode" represents by what is now recognized as an entire class of optoelectronic devices. A title more specific to the particular invention is recommended, for instance "Short-Wavelength Photodiode of Enhanced Sensitivity with Low Leak Current".

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 1 and 3 are rejected under 35 U.S.C. 102(b) as being anticipated by the international journal publication by Wen-Shiung Lour and Chung-Cheng Chang in Solid-State Electronics, Vol. 39, issue 9, pp. 1295-1298 (1996).

With regard to claim 1: the PIN photodiode exhibited in Fig. 1 of Wen-Shiung Lour and Chung-Cheng-Chang comprises an absorption layer consisting of i-ZnSe, a semiconductor, thus forming the equivalent of the "first conductive type semiconductor region" in the present invention; two

n^+-semiconductor regions at the surface of the intrinsic region of i -ZnSe as exhibited in Fig. 1 are equivalent to the "plurality of second conductive type semiconductor layers". The "first conductive type semiconductor region and the plurality of second conductive type semiconductor layers" constitute "an optical detection portion for detecting an optical signal band outputting its photoelectric conversion signal", because the device exhibited in Fig. 1 is a photodiode. Furthermore, the surface of the first semiconductor region (i-ZnSe) between the two "second conductive type semiconductor [n^+] regions" is absent, as shown in Fig.1. With regard to claim 1 there is no essential difference between the case when this part of the surface is "absent" and the case when this surface has been "removed", because the method of manufacturing does not concern the invention. In summary, claim 1 is unpatentable by virtue of being anticipated by Wen-Shiung Lour and Cheng-Chung Chang.

With regard to claim 3: in the previous paragraph claim 1 on which claim 3 depends has been shown to be unpatentable in view of being anticipated by Wen-Shiung Lour and Chung-Cheng Chang. Furthermore, in their aforementioned journal article Wen-Shiung Lour and Cheng-Cheng Chang specifically mention with regard to the device depicted in their Fig.1 that formed the basis of the above stated rejection of claim 1 that "standard photolithography and wet etching techniques are used to implement the device". See page 1296 of their article, first sentence. Therefore, claim 3,

which only adds to claim 1 the specification that wet etching is used, clearly is also anticipated by Wen-Shiung Lour and Chung-Cheng Chang.

In summary, claims 1 and 3 are unpatentable in view of the journal publication by Wen-Shiung Lour and Chung-Cheng Chang (September 1996).

4. Claim 1 is rejected under 35 U.S.C. 102(b) as being anticipated by Japanese Patent JP07106415A (April 1995). In particular, the photodiode shown in Fig. 5c of JP07106415A comprises a p-type layer, thus forming the equivalent of the "first conductive type semiconductor region" in the present invention; while the two n^+-semiconductor regions at the upper surface of the p-type layer as shown in Fig. 5c are equivalent to the "plurality of second conductive type semiconductor layers". The "first conductive type semiconductor region and the plurality of second conductive type semiconductor layers" constitute "an optical detection portion for detecting an optical signal band outputting its photoelectric conversion signal", because the device shown in Fig. 5c represents a/o a photodiode, as indicated by the title and abstract of JP07106415A. Furthermore, the surface of the first semiconductor region [p-type layer] between the two "second conductive type semiconductor [n^+-type] regions" is absent, as shown in Fig.5c. With regard to claim 1 there is no essential difference between the case when this part of the surface is

"absent" and the case when this surface has been "removed", because the method of manufacturing does not concern the invention. In summary, claim 1 is unpatentable by virtue of being anticipated by JP07106415A.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over the journal article by Wen-Shiung Lour and Chung-Cheng Chang in Solid-State Electronics, Vol. 39, issue 9, pp. 1295-1298 (1996).

Claim 2 depends on claim 1 which was shown to be unpatentable over Wen-Shiung Lour and Chung-Cheng Chang. Furthermore, the examiner takes official notice of the circumstance that for reasons of efficiency the selection of the value of the "distance between the second conductive type semiconductor layers formed on the surface of the first conductive type semiconductor region" as performed by one of ordinary skill in the arts must be between "0.5 to 2 times a width of the depletion layer in the horizontal direction formed by reverse biasing" (reverse biasing is the functional operational mode of photodiodes): if this distance were chosen to be less than half the width of the depletion layer there would be no net

gain in having two separate second conductive type semiconductor regions and two electrodes. The cusp visible in Fig. 3 of the invention and cited as Prior Art would then be smoothed out, hence this Prior Art satisfies this part of the inequality. On the other hand, if the aforementioned distance were chosen to be greater than twice the depletion layer width the depletion layer would no longer be contiguous, resulting in a loss of photosensitivity because the first conductive type semiconductor region between the second conductive type semiconductor areas would be left unexploited. This would also be in contrast with the Prior Art shown in Fig. 3 of the present invention because this figure does show a contiguous depletion area. Therefore, it would have been obvious to one of ordinary skills in the art to further specify the device taught by Wen-Shiung Lour and Chung-Cheng Chang so as to select the distance between the second conductive type semiconductor regions according to the directive of claim 2.

Conclusion

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Johannes P Mondt whose telephone number is (703) 306-0531. The examiner can normally be reached on 8:00 am - 5:30 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nathan J Flynn can be reached on (703) 308-6601. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-7722 for regular communications and (703) 308-7724 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

JPM
May 30, 2001

Nathan Flynn
Primary Examiner